

Work Order ID 74928

74928

U/R

Page 1

October 13, 2011 1:03:41 PM

Item ID: D350-748-101

Accept

N9000040100

Setup Start

NS1

Revision ID: U/R

Stop

NS2

Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11 Start Qty: 1.00

1

Cust Item ID:

Required Date: 11/11/11 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr

Revision Nbr

D350-748-141

FUR OK CP 11.10.17

100

0.00

100

DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile & type labels per PPPD350-748-101

CHG002

5 12/01/02

OK for MHS 11/12/21

110

0.00

110

BENDING MACHINE - CROSSTUBES

CNC Bend 1

Memo

0.00

CNC Delta 100 Bender

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT

SAD 11-11-10

120

QC15- Crosstube Dimensional Check

0.00

120

QC

Memo

0.00

Quality Control

Sutula

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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Page 2

October 13, 2011 1:03:41 PM

Item ID: D350-748-101

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N900040100

Setup Start ***NS1***

Revision ID: U/R

Stop ***NS2***

Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 11/11/11 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Run Start ***NR1***

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop ***NR2***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

125

0.00

125

HandFXtube

Memo

0.00

Hand Finishing Crosstubes

Stress relief

Heat treat crosstube as per QSI010 4.3

Temp: 375

Start time: 620

Finish time: 1040

① SAD 11-12-11

127

QC6- Inspect dimensions to drawing

0.00

127

QC

Memo

0.00

Quality Control

Sully

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Page 3

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Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

130

0.00

130

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs,
Set-up drill table as per QSI 010

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-141

4-Remove all marks from tube within limits of D350-748-141

5- Apply a light coat of LPS3 on the interior of tube

Batch: M109956

140

QC5- Inspect part completeness to step on W/O

0.00

140

QC

Memo

0.00

Quality Control

CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)

Handwritten notes and dates:
85
11-11-14
MO 11-11-14
MO 11-11-15

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Page 4

October 13, 2011 1:03:41 PM

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Stop ***NS2***

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Start Date: 10/13/11 Start Qty: 1.00

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Run Start ***NR1***

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Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150 Outsource process-Cadplate per QSI017 4.1.9.1 0.00

150

Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 15462
Stress relief at 375° for 5 hours
Magnetic Particle Inspect per ASTM E1444
Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2
Embrittle relief at 375° for 8 hours, Chromate Treat
Possibe Supplier: Southwest United Industries
Ensure Certificate of Conformity is attached

11-11-15
①

160 Receive & Inspect for Damage & Mat'l Certs 0.00

160

Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

11/12/11
①

★ SEE W/O CHG ATTACHED

170 QC5- Inspect part completeness to step on W/O 0.00

170

QC

Memo

0.00

Quality Control

11/12/11
①

issue P/O: 15634 to NDT acmen

CZ1112108 ①

acc'd. 11/12/11
①

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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October 13, 2011 1:03:41 PM

74928

Page 5

Item ID: D350-748-101 Accept ***N900040100*** Setup Start ***NS1***
Revision ID: U/R Stop ***NS2***
Item Name: Crosstube Installation, High Fwd
Start Date: 10/13/11 Start Qty: 1.00 ***1*** Cust Item ID:
Required Date: 11/11/11 Req'd Qty: 1.00 ***1*** Customer:
Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start ***NR1***
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180 *180* SprayPaint Spray Painting	SprayPaint Memo 1-Prime inside crosstube as per QSI 005 4.2 2-Prime Outside of Tube as per Dart QSI 005 4.2	0.00 0.00		1A8	11-12-19				
190 *190* QC Quality Control	QC14- Inspect Spray Paint Memo Then, Wrap in plastic bag to protect from scratches	0.00 0.00							① 11-12-20
200 *200* Crosstubes Crosstubes	Crosstubes Memo 1-Install Ground wire Insert, then insert screw and washer 2-Install Abrasion strips as per Dwg D350-748-141 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS	0.00 0.00							11 - 12 - 20

W/O:		WORK ORDER CHANGES					
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Work Order ID 74928***74928***

Page 6

October 13, 2011 1:03:41 PM

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Revision ID: U/R

Stop ***NS2***

Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11 Start Qty: 1.00

1

Cust Item ID:

Required Date: 11/11/11 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

210

QC5- Inspect part completeness to step on W/O

0.00

210

QC

Memo

0.00

Quality Control

220

Pick Kit

0.00

220

Packaging

Memo

0.00

Packaging

230

QC4- 100% Inspect kits for completeness

0.00

230

QC

Memo

0.00

Quality Control

W/O:		WORK ORDER CHANGES					
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Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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74928

Page 7

October 13, 2011 1:03:41 PM

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 Revision ID: U/R Stop ***NS2***
 Item Name: Crosstube Installation, High Fwd
 Start Date: 10/13/11 Start Qty: 1.00 ***1*** Cust Item ID:
 Required Date: 11/11/11 Req'd Qty: 1.00 ***1*** Customer:
 Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start ***NR1***
 QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
240	Packaging					12/1	12/1		
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: 102								
	PPP Rev: c								
250	QC21- Final Inspection - Work Order Release	0.00							
250						CK	12/01/04		
QC	Memo	0.00							
Quality Control									

M.L.J 12/01/03
 ①

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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Picklist Print

October 13, 2011 1:03:50 PM

Page 1

Work Order ID: 74928

74928

Parent Item: D350-748-101

D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

Comments:

IPP Rev:A New Issue 06-07-05 JLM
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ
 IPP Rev:C Rev B 07-11-15 DD
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	-------------	--------------	---------------	----------------	--------

D350-748-141TRN

Manufactured

No

110

Each

0.0000

1

1

D350-748-141TRN

Crosstube Turning Detail

ALS4-1032-225

Purchased

No

200

Each

2,660.000

1

1

AI S4-1032-225

Insert

**

Location

Loc Qty

Loc Code

ST282

2660

108696

808

110768

62

118386

860

118966

930

AN960JD10

NAS1149D0363J Purchased

No

200

Each

0.0000

1

1

AN960JD10

Washer

**

119537

RT 11-12-20

B23575**

SAD 11-11-10

RT 11-12-20

SL

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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Picklist Print

October 13, 2011 1:03:50 PM

Page 2

Work Order ID: 74928

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

74928

D350-748-101

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

D2856-400

Manufactured No

200 f

334.8845

1.181

1.243158

D2856-400

Abraison Strip

**

25 11-12-20

Location

Loc Qty

Loc Code

ST403

0.3149

68076

0.3149

ST409

334.5696

63735

0.6696

71164

117.9

73491

216

x 1.181

D3502-1

Manufactured No

200 Each

59.0000

2

2

D3502-1

Support

**

25 11-12-20

Location

Loc Qty

Loc Code

ST063

59

61206

3

64004

10

68951

12

72129

14

73419

20

x 2

MS21920-20

Purchased No

200 Each

56.0000

2

2

MS21920-20

Clamp (per MIL-DTL-8783C)

**

25 11-12-20

Location

Loc Qty

Loc Code

LG050

56

116799

10

118649

46

x 2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

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October 13, 2011 1:03:50 PM

Page 3

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Parent Item Name: Crosstube Installation, High Fwd

74928

D350-748-101

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

165.0000

1

1

MS27039-1-10

Screw

**

11-12-20

119531

Location

Loc Qty

Loc Code

ST291

165

118612

165

AN4-41A

Purchased

No

220

Each

293.0000

8

8

AN4-41A

Bolt

**

[Signature]

Location

Loc Qty

Loc Code

ST360

293

115108

18

115705

50

116191

50

117619

50

117795

25

118451

50

118838

50

117795

AN4-6A

Purchased

No

220

Each

6,024.000

16

16

AN4-6A

Bolt

**

11/12/21

Location

Loc Qty

Loc Code

ST356

1018

118422

118

118628

400

118838

300

119127

200

ST358

6

117514

6

ST516

5000

119017

5000

119017

October 13, 2011 1:03:50 PM

Shop Packet Print

Page 3

W/O:		WORK ORDER CHANGES					
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October 13, 2011 1:03:50 PM

Page 4

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D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

AN5-32A

Purchased

No

220

Each

171.0000

4

4

AN5-32A

Bolt

**

118628

Location

Loc Qty

Loc Code

ST339

75

118628

50

118983

25

ST340

96

117872

46

118422

50

AN960JD416

NAS1149D0463J

Purchased

No

220

Each

0.0000

32

32

AN960.ID416

Washer

**

119075

AN960JD516

NAS1149D0563J

Purchased

No

220

Each

0.0000

8

8

AN960.ID516

Washer

**

118206

D3500-1

Manufactured

No

220

Each

20.0000

4

4

D3500-1

Saddle

**

B 76000 12/1/09

Location

Loc Qty

Loc Code

ST424

20

66127

8

68947

12

October 13, 2011 1:03:50 PM

Shop Packet Print

Page 4

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Page 5

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Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

D3501-1

Manufactured No

220

Each

213.0000

16

16

D3501-1

Bushing

**

73391

[Signature]

Location

Loc Qty

Loc Code

ST063

202

68939

102

70682

100

ST066

11

67757

11

MS21042L4

Purchased

No

220

Each

14,231.00

24

24

MS21042L4

Nut

**

[Signature]

Location

Loc Qty

Loc Code

ST300

3231

117441

51

117601

557

117885

56

118451

1567

118927

1000

ST516

6000

119017

6000

ST518

5000

119075

5000

119017

W/O:		WORK ORDER CHANGES					
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October 13, 2011 1:03:50 PM

Page 6

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Parent Item: D350-748-101

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Parent Item Name: Crosstube Installation, High Fwd

Start Date: 10/13/11

Required Date: 11/11/11

Start Qty: 1.00

Required Qty: 1.00

MS21042L5

Purchased

No

220

Each

2,574.000

4

4

**

MS21042L5

Nut

Location

Loc Qty

Loc Code

ST300

1074

116105

5

116548

53

117441

138

117611

82

118179

496

118910

300

ST518

1500

119109

1500

118910

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

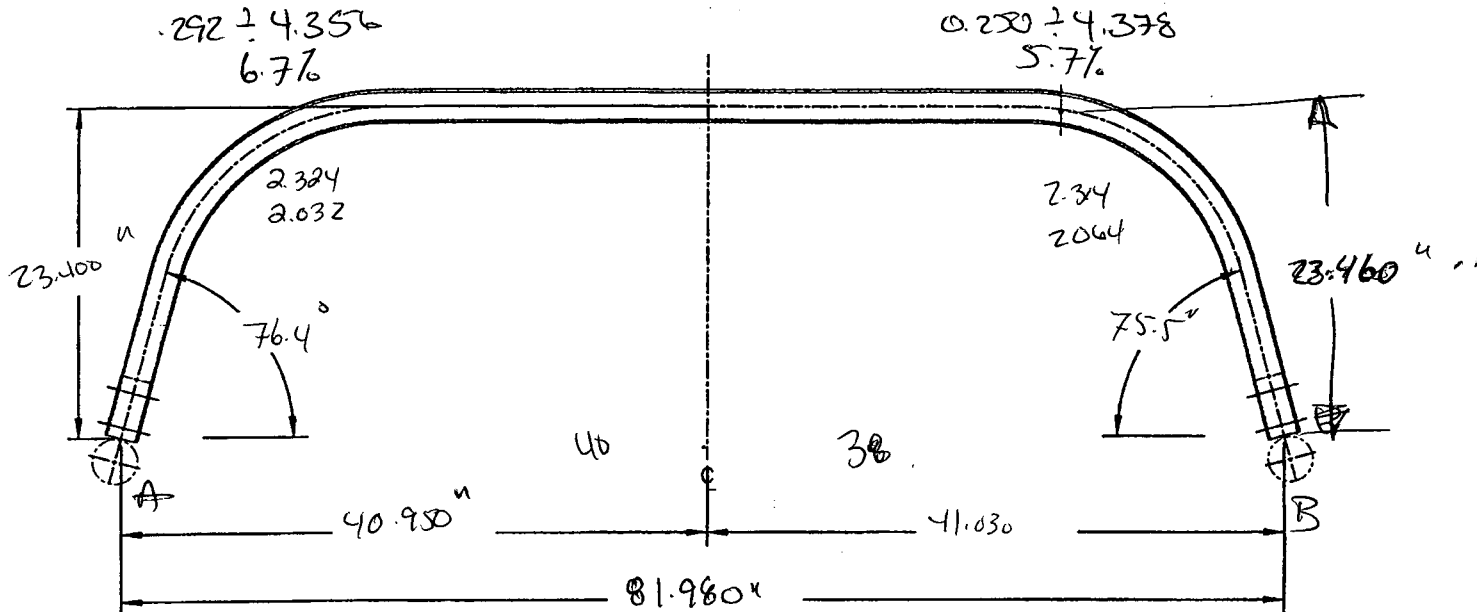
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	74928
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141	Rev: E	Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = 0.306
Side A = 6.7% crushing @ 40 pass
Side B = 5.7% crushing @ 38 pass
Bent high twist high. Acceptable @ 3042 @ 11.11.11

QC15 Inspection	S
Date	11/11/11

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 74928
11/10/12

OK 11/10/12
UNDER REVIEW
11/10/12

RELEASED
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-048 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	99	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	99	DRAWING NO. REV. F D350-748-141 SHEET 1 OF 4	
CHECKED	99	TITLE SCALE CROSSTUBE (AS 350/355 HI FWD) NTS	
MFG. APPR.	99	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	
DE APPR.	99	DATE 10.11.23	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

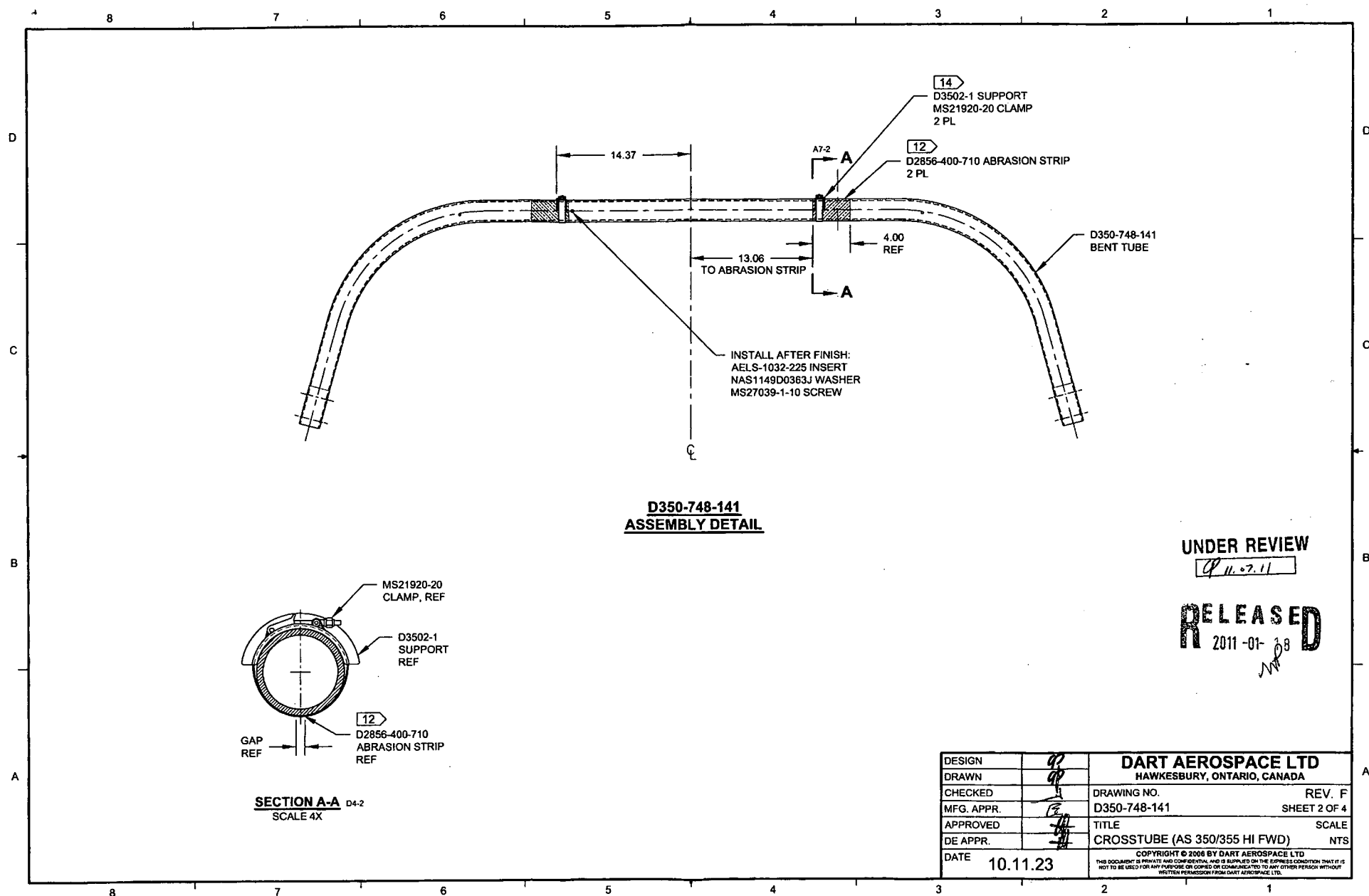
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

74928

Handwritten signature

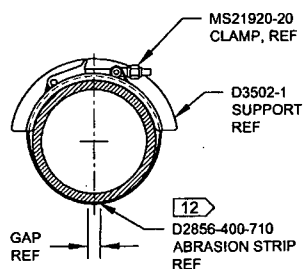


**D350-748-141
ASSEMBLY DETAIL**

UNDER REVIEW

CP 11.07.11

RELEASED
2011-01-30



SECTION A-A D4-2
SCALE 4X

DESIGN	92	DART AEROSPACE LTD	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. F
MFG. APPR.	92	D350-748-141	SHEET 2 OF 4
APPROVED	92	TITLE	SCALE
DE APPR.	92	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMERCE TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

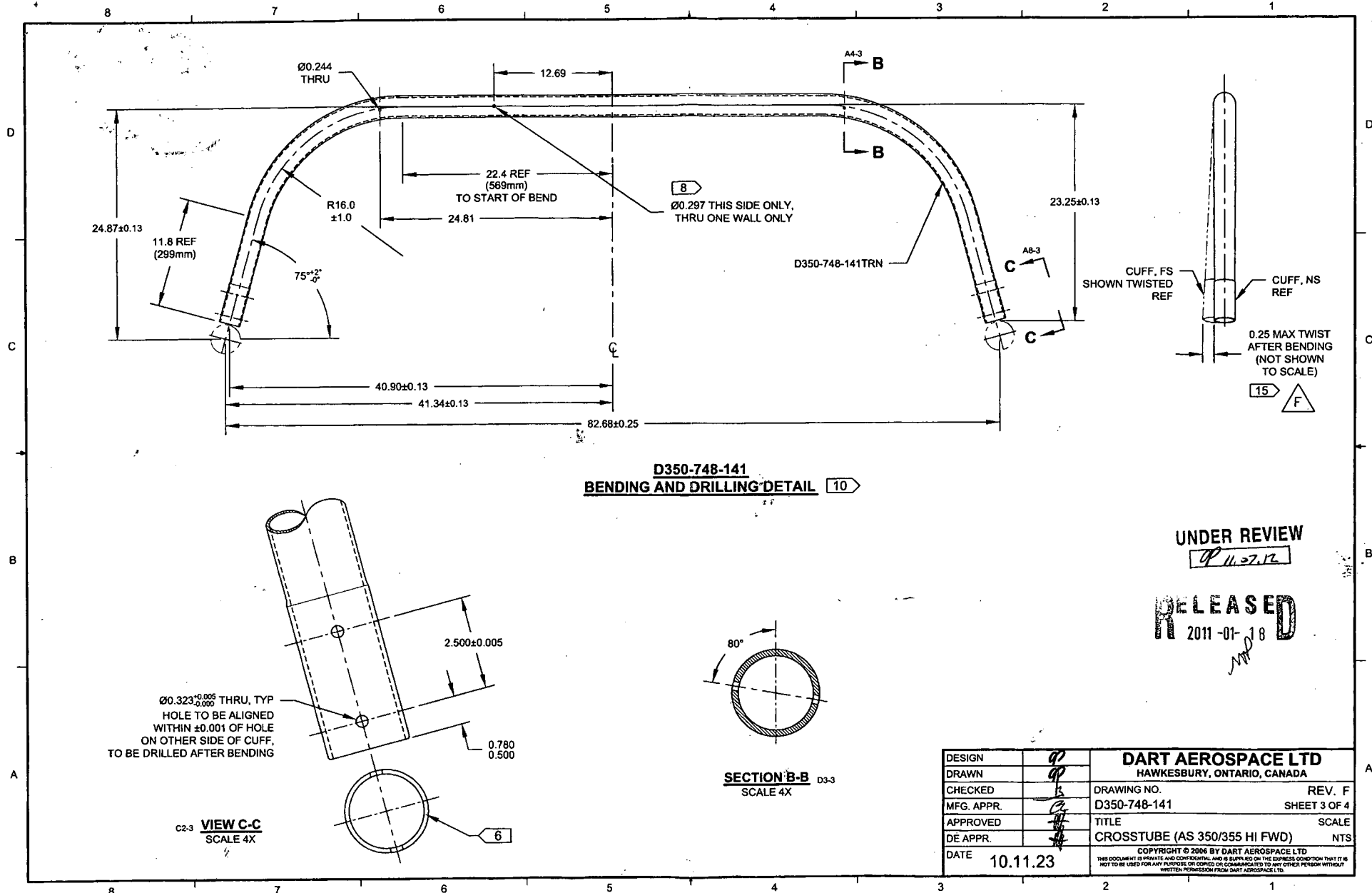
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

74928 ~~74928~~

Handwritten signature



UNDER REVIEW
11-27-12

RELEASED
2011-01-18
MD

DESIGN	DP	DART AEROSPACE LTD	
DRAWN	DP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	h	DRAWING NO.	REV. F
MFG. APPR.	h	D350-748-141	SHEET 3 OF 4
APPROVED	h	TITLE	SCALE
DE APPR.	h	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSES OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Alben



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
11.10.05	161	LOAD TUBE TO 3500 ^{lb} FOR 1 MINUTE. REF D.S. EMAIL.				CP 11.10.12 OS/1042		
11.10.05	162	NDT TUBE.				CP 11.10.12 OS/1042		

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Chris Provencal

From: David Shepherd <dshepherd@dartaero.com>
Sent: Tuesday, April 27, 2010 3:40 PM
To: 'Mike Petsche'
Cc: 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com
Subject: 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

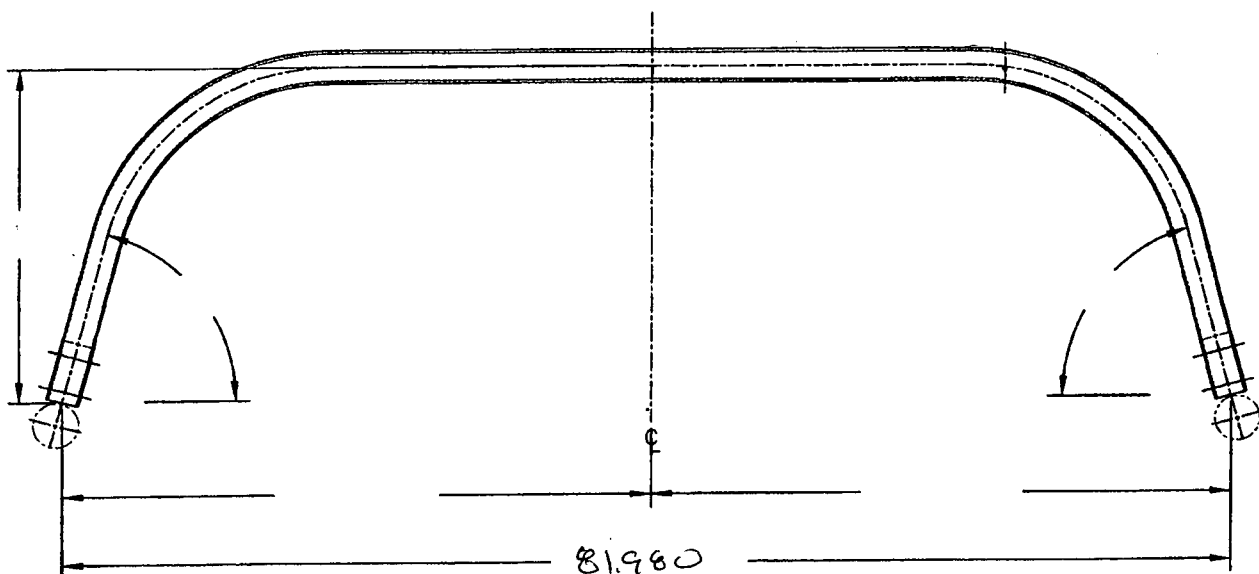
For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

DART AEROSPACE LTD	Work Order:	
Description: Crosstube High Fwd (AS350/355)	Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: F		Page 1 of 1

For stress relief

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = 0.25 0.306

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	

**CERTIFICATE OF
CONFORMANCE**

CADORATH PLATING CO. LTD.
2150 LOGAN AVENUE
WINNIPEG, MANITOBA R2J-0J1

DATE: Nov-25-2011

CONSIGNEE TO: Dart Aerospace Ltd.
1270 Aberdeen St.
Hawksbury, ON K6A 1K7

W/O #: 109691

INVOICE #: 57840

CONTRACT OR
PURCHASE ORDER # 15462

DESCRIPTION: SKID

QTY 1

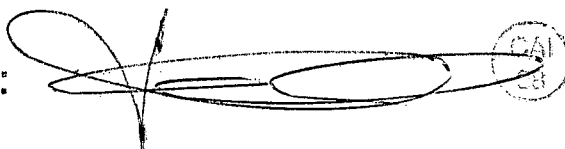
P/N # d350-748-101

S/N # (B74928)

STRESS RELIEVE BAKE HEAT CHART #11-1209. MPI IAW ASTM-E-
1444. CADMIUM PLATE IAW AMS-QQ-P-416C TYPE 2 YELLOW
CLASS 2. BAKE HEAT CHART # 11-1236.

CERTIFICATE: I certify that the items indicated here on have
been inspected and tested and conform to all specifications
and requirements detailed on the contract or purchase order.

Approved Inspector:





LIQUID PENETRANT TEST REPORT

P- 12242

PAGE 1 OF 1

CLIENT	DART Aerospace	DATE	Dec 7, 2011	TIME	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>
ATTENTION	LINDA	ACUREN JOB No.	188-11-02400		
ADDRESS	1770 ABENDEEN ST HAWAII BAY, O.N.	PO/NO No.			
		WORK LOCATION	SAME		
PROJECT	F.P.I. ON CROSS TUBES & ENGINE MOUNTS	ACCEPTANCE STD.	ASTM 1417/01-088	REV./DATE	2005
ITEM(S) EXAMINED	A WET FLUORESCENT LIQUID PENETRANT INSPECTION WAS CARRIED OUT 100% EXTERNAL				
JOB DESCRIPTION	PROCEDURE No. LT-012	REV./DATE	2008	TECHNIQUE No. LT-1042	REV./DATE 2008
PART NO.	SEE RESULTS	MATERIAL	ALUMINUM	THICKNESS	VARIABLES
SCOPE	10 CROSS TUBES, 2 ENGINE MOUNTS				

TEST DETAILS

METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED
FAMILY BRAND	MAGNAFLUX		BLACK LIGHT S/N	10459	<input type="checkbox"/> OUTPUT > 1000 μ W/cm ²
PENETRANT	2-02	MINIMUM DWELL TIME	450	MIN.	<input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT
PENETRANT REMOVER	N10	MINIMUM DRY TIME	>10	MIN.	<input type="checkbox"/> OUTPUT > 100 fc @ SURFACE
DEVELOPER	SKD 5.2	MINIMUM DWELL TIME	10	MIN.	OTHER LABINO
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS	<input type="checkbox"/> AQUEOUS	<input type="checkbox"/> DRY	LIGHT METER S/N	1098866
				CAL DUE DATE	FEB 12 2012

TEST SURFACE

SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input type="checkbox"/> CLEAN BARE METAL
SURFACE TEMPERATURE	<input type="checkbox"/> < -4°C/20°F	<input type="checkbox"/> -4°C/20°F TO 10°C/50°F	<input checked="" type="checkbox"/> 10°C/50°F TO 52°C/125°F	<input type="checkbox"/> > 52°C/125°F	

RESULTS-

☒ METRIC ☐ IMPERIAL

1	ENGINE MOUNT #73732	✓
1	- CROSS TUBE W.O. 75831	✓
1	- CROSS TUBE W.O. 75830	✓
1	ENGINE MOUNT #73731	✓
1	- CROSS TUBE W.O. 77109	✓
1	- CROSS TUBE W.O. 77108	✓
2	- CROSS TUBE W.O. 74928	✓
1	- CROSS TUBE W.O. 77290	✓
1	- CROSS TUBE W.O. 77291	✓
1	- CROSS TUBE W.O. 74930	✓
1	- CROSS TUBE W.O. 74924	✓
1	- CROSS TUBE W.O. 74667	✓

- REPAIR

- REPAIR

- REPAIR

- TARE IN DRILL HOLE

- NOTE & REPAIR

Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE	Bar Titley	SIGNATURE		DTR #	E90917
TECHNICIAN (SIGNATURE):	Mike Iltis	1 st TECHNICIAN		REPORT REVIEWED BY:	
NAME (PRINT):	Mike Iltis	2 nd TECHNICIAN		NAME	INITIALS
CGSB LEVEL	I	SNT LEVEL	F	CGSB LEVEL	
CGSB REG. NO.	6606	CGSB REG. NO.		CGSB LEVEL	

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GOLD - OFFICE COPY

PT Sept 2005